S-69-46 December, 1969 5230

BIOLOGICAL EVALUATION OF SARATOGA SPITTLEBUG ON THE CHEQUAMEGON NATIONAL FOREST BASED ON 1969 SCAR-COUNT SURVEYS

By Glen Erickson and Imants Millers

ABSTRACT

Saratoga spittlebug scar-count surveys on the Chequamegon National Forest reveal outbreak areas on the Hayward and Glidden Ranger Districts and one heavily damaged plantation on the Park Falls Ranger District. The Forest Manager is advised to consider chemical suppression of the spittlebug. Ultra-low volume application of Malathion at 10 fl. oz. per acre from the air is the recommended control method. Supplemental scar-count surveys are recommended for plantations in the vicinity of the detected outbreak areas. Further survey needs are indicated for each plantation examined in 1969.

INTRODUCTION

The Saratoga spittlebug, Aphrophora saratogensis (Fitch), is one of the major pests of young red pine plantations in the Lake States. The scars caused by adult feeding on pine branches are used to estimate the preceeding season's damage, and to estimate next year's spittlebug population. The scar-count surveys are made annually on selected susceptible red pine plantations. When an outbreak is detected, all susceptible plantations in the vicinity of the outbreak are surveyed to determine if additional plantations are damaged. Then the Forest is advised to consider chemical suppression to prevent damage. Nymphal surveys to confirm continuation of the outbreak in the spring are planned for the plantations proposed for control.

BIOLOGICAL REVIEW

A. Causal Agent

The Saratoga spittlebug, Aphrophora saratogensis (Fitch)

B. Host

Red pine, Pinus resinosa Ait.
Alternate hosts are Comptonia spp., Rubus spp. and other woody shrubs. Other pines in the area may be attacked, but damage usually is not serious.

C. Type of Damage

The adult spittlebugs feed on 1-5 year old internodes of branches and the main stem. Necrotic areas, i.e. scars, are produced in the phloem, cambium and newly formed xylem as a result of the feeding. One season's accumulation of 35 or more scars per 4 linear inches of twig interferes with food and water translocation. At first, stunting of terminal growth occurs. Continued severe feeding in successive years results in branch and terminal die-back, i.e. flagging, and eventually, tree mortality. Thus, economic loss occurs from tree growth reduction, poor tree form and quality, and tree mortality (Ewan, 1961).

D. Ecological Considerations

The Saratoga spittlebug outbreaks are greatly affected by the tree host-alternate host ratio and climatic conditions (Ewan, 1961).

Spittlebug eggs overwinter under bud scales of red pine on the branches of the upper crown. The young nymphs, immediately after hatching from eggs in May, drop from the tree and migrate to herbaceous plants. When about 2 weeks old they move to woody shrubs, particularly sweet fern, Comptonia sp., and raspberries, Rubus sp. Indications are that local alternate host preferences do occur.

The spittlebug abundance is related to the host and alternate hosts available for oviposition, nymphal development and adult feeding. Generally, red pine plantations in the Lake States are susceptible to outbreak populations after the trees are 2 feet tall and until crown closure eliminates alternate hosts, i.e. tree height of about 14 feet with stocking at 1000 trees per acre. By causing tree stunting and mortality, unchecked spittlebug populations are able to maintain open red pine stands and thus prolong outbreak conditions. Other red pine pests, such as white grub, Scleroderris pine canker and defoliators may also produce conditions favorable to spittlebug outbreaks.

Weather is another ecological factor that can have adverse effects on spittlebug populations. Spittlebug nymphs are relatively protected at the root collar of the alternate host. However, late spring temperatures in the low 20's may cause nymphal mortality. Also, the nymphs are readily susceptible to desiccation first during migration from red pine to herbaceous plants and later to woody shrubs.

A few parasites and predators are reported for Saratoga spittlebug, but none effectively reduce outbreak populations.

SURVEY METHODS

Scar-count surveys are made to detect and evaluate Saratoga spittlebug outbreaks (Millers, 1968). Sample areas are selected systemically from a list of susceptible red pine plantations. An attempt is made to examine a plantation every 4 years, but more frequently when spittlebug build-up is detected.

All the scar-counts on the Chequamegon National Forest were made by District personnel during the first 2 weeks in October-- according to instructions provided by the staff of the St. Paul Field Office (Millers and Erickson, 1969).

About 20 samples are taken from each plantation. Each sample is a count of scars on a 4 inch long twig taken from the penultimate internode of an upper crown branch.

The scar-counts determine the severity of damage, and indirectly, the spittlebug populations. The following classification is used:

Light	- less than 20 scars/twig
Moderate	- 20-35 scars/twig
Heavy	- more than 35 scars/twig

When heavy damage is found in a portion of a plantation, the entire plantation is classified as heavy.

When spittlebug outbreak centers are detected from the selected plantation samples, a supplemental scar-count survey is recommended to delineate the outbreak boundaries.

SURVEY RESULTS AND DISCUSSION

The results of the scar-count survey are shown in Table I. The scar-count populations and the recommended action for each plantation is provided in the table. The Forest Manager is advised to consider the recommendations, and plan for future work.

Two major outbreak areas are apparent (Map 1). On the Hayward Ranger District in T42N, R5W, one plantation has high scar counts. On the Glidden Ranger District,(T43N, R4W),two plantations are infested.

One plantation on the Park Falls Ranger District,(T40N, R2E),has high scar-counts.

The Forest is advised to consider chemical suppression in the plantations with high scar-counts. In addition, supplemental scar-counts are recommended for the Hayward and Glidden Ranger Districts to examine plantations near the outbreak area (Table II). Plantation records indicate there are no plantations in the vicinity of the heavily damaged area on the Park Falls Ranger District and subsequently no supplemental scar-count surveys are needed. The plantation in T39N, R3E, has a moderate spittlebug population. A nymphal survey, and suppression consideration, is recommended if the other area on the District is treated and provided high nymphal population is present.

Future surveys are recommended on basis of scar-counts and tree heights. When the trees can outgrow spittlebug hazard before the next survey, the plantation is dropped from future surveys. Plantations with poor stocking, or areas less than 10 acres are recommended to be dropped because of doubtful economic benefits.

SUPPRESSION INFORMATION

Saratoga spittlebug is controlled with Malathion LV R/. Concentrate applied from air at ultra-low volume at 10 fl. oz. per acre. The most recent suppression costs for marking, aircraft and insecticide and manpower have been about $4.00 per acre (unknown, 1969).

Spraying is timed to kill the adult spittlebugs before they lay eggs. As a general rule, at least 90% of nymphs should have transformed into adults before treatment. Usually, spraying takes place in late July or early August.

Malathion is a relatively safe insecticide when applied at recommended rates. However, spraying of open waters should be avoided. Label warnings for handling must be observed. Malathion is toxic to bees, and beekeepers in the area should be informed before spraying. The LVC application is hazardous to acrylic paints, such as used by General Motors cars.

R/ Registered by American Cyanamid Company; contains 95% tech. malathion.

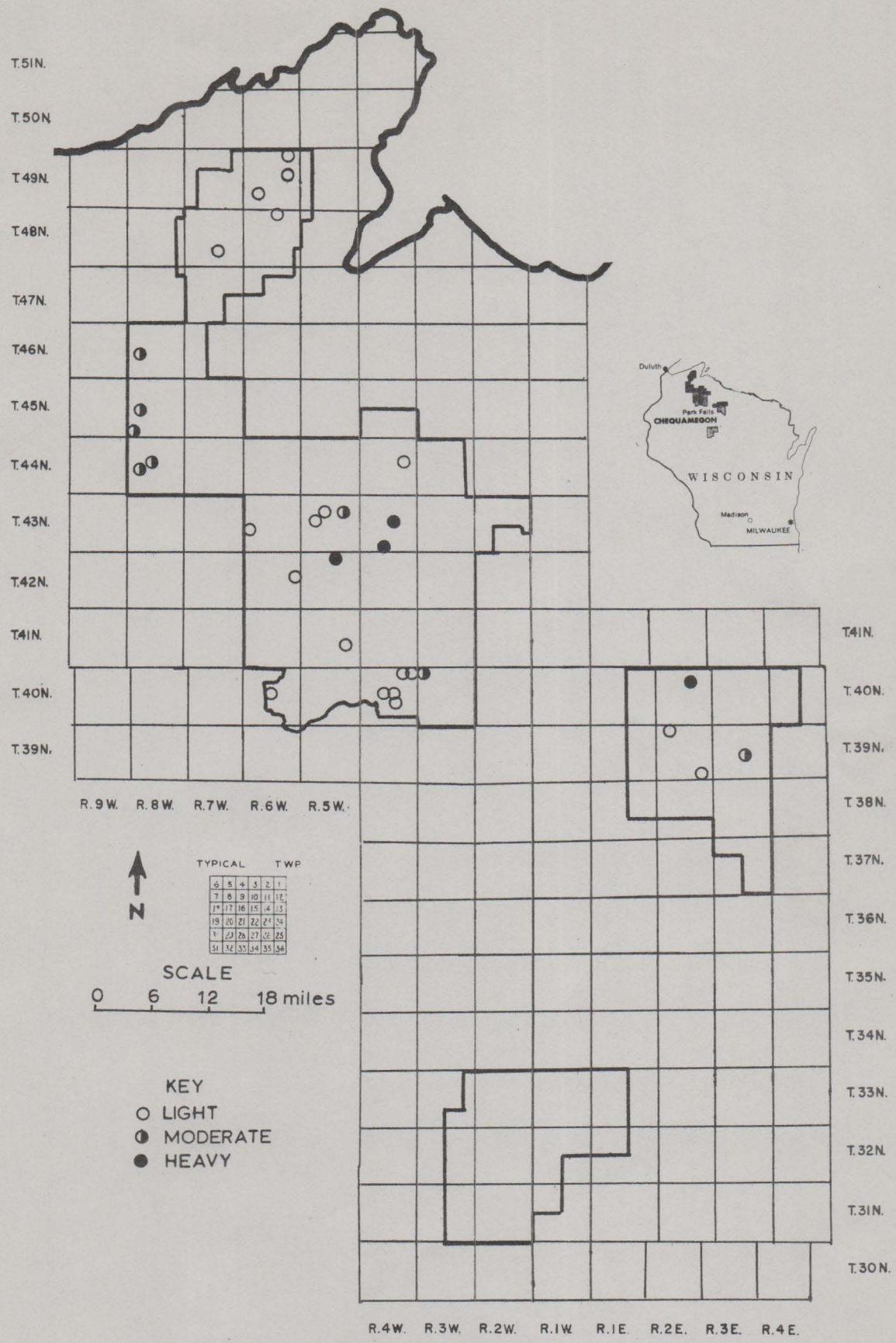
Table I. Results of Saratoga Spittlebug Scar-Count Survey
1969 - Chequamegon National Forest

	LOCATION			AREA	TREES		SURVEY RESULTS	
District & Plantation ID. No. 1/	T	R	S	Acres	T/A	Ht./Ft.	Scars	Recommendations
Glidden Ranger District								
37-2,15,6	40	3W	6	20	200	4	M	Scar-count '71
24-3	40	4W	1	14	500	5	L	Scar-count '73
24-8	40	4W	2	10	500	4	L	Scar-count '73
17-17	40	4W	15	70	600 2/	8	L	Scar-count '73
16/17-2/35	40	4W	16	24	500 2/	4	L	Scar-count '73
17-17	40	4W	22	51	500	6	L	Scar-count '72
127-4	43	4W	15	10	100	4	H	Nymph '70 3/
126-16,19	43	4W	33	37	600	6	H	Nymph '70 3/
199-9	44	4W	14	14	800	6	L	Scar-count '73
Hayward Ranger District								
164-1	40	6W	16	38	500	-	L	Scar-count '72
165-9,10	40	6W	23,26	85	---	-	-	Drop-repl. to Wh.Sp.
129-18	41	5W	1,12	--	---	-	-	Drop-trees too tall
177-5	41	5W	23	20	400	3	L	Drop-no hazard
----	41	6W	17	2	---	-	-	Drop-area too small
85-9	42	5W	1	31	600	15+	-	Drop-trees too tall
84-5	42	5W	3	30	500	4	H	Nymph '70 3/
----	42	5W	15	8	---	-	-	Drop-area too small
79/80-25/7	42	6W	1	31	400	-	-	Drop- need release
90-21	42	6W	13	44	700	5	L	Scar-count '73
50-16	43	5W	9	40	600	5	L	Scar-count '73
50-17	43	5W	11	50	800	6	M	Scar-count '71
----	43	5W	12	3	---	-	-	Drop-area too small
57-11	43	5W	17	59	600	4	L	Scar-count '72
----	43	6W	19	5	---	-	-	Drop-area too small
52-2	43	6W	19	67	800	5	L	Scar-count '73
Park Falls Ranger District								
61b	39	2E	5	8	800	9	L	Drop-area too small
67-11	39	2E	35	15	600	8	L	Scar-count '73
126-8,10	39	3E	15,22	35	600	6	M	Nymph '70 3/
35-19	40	2E	10	69	800	6	H	Nymph '70 3/
Washburn Ranger District								
33-9	44	8W	16	90	1300	9	M	Scar-count '71
34-18,19	44	8W	17,20	100	1100	9	M	Scar-count '71
112 abc	44	8W	17,20,21	38	700	-	-	Included with above
62-4	45	8W	17	40	1100	9	M	Scar-count '71
61-8	45	8W	31	80	500	5	M	Scar-count '72
107/108-18/16	46	8W	17,20	237	800	4	M	Scar-count '71
181-5	48	6W	3	37	1000	7	L	Scar-count '72
156-136,138	48	7W	27,28	23	500	11	L	Drop trees too tall
221-16	49	6W	2	20	200	9	L	Scar-count '73
207-2	49	5/6W	13/18	31	---	9	-	Drop-poor stocking
208-7,8	49	6W	14	70	700	8	L	Drop-no hazard
200-6	49	6W	29	40	1000	6	L	Scar-count '72

1/ xxx-xx Compartment number - stand number

2/ Parts of plantation have only 100 T/A. Recommend the Ranger review its spittlebug survey needs.

3/ Nymph - yr.= nymphal survey, if suppression is proposed; when no suppression, drop the plantation from further surveys.



Map I. Saratoga spittlebug populations in red pine plantations on the Chequamegon National Forest - 1969

Table II. Areas Recommended for Supplemental Scar-counts - 1969

Plantation No.	T	R	S		Acres
Glidden Ranger District					
86c	42	4	9,16		41
86b	42	4	19		22
C-170	43	4	7,8		26
C-179	43	4	12		25
86b	42	4	17,19,20,30		61
				TOTAL	175
Hayward Ranger District					
50a	42	5	16		10
C-138	43	5	16		42
				TOTAL	52

Scar count
6 plots - 36+ 3-4 ft tall
(1) 3 " 30+ 1000/acre

RECOMMENDATIONS

1. The Forest Manager is advised to consider chemical suppression for Saratoga spittlebug on Hayward, Glidden, and Park Falls Ranger Districts.

2. Supplemental scar-count surveys are recommended for Hayward and Glidden Ranger Districts to delineate the entire spittlebug outbreak.

3. All the Districts have recommendations for future surveys of their plantations that were surveyed in 1969. The Forest Manager should act on the recommendations.

LITERATURE CITED

Ewan, H.G. 1961. The Saratoga Spittlebug. USDA Tech. Bull.1250 52 pp.

Millers, I. 1968. Biological Evaluation of Saratoga Spittlebug as based on 1968 scar-count surveys on National Forests in the Lake States. USDA, Forest Service, State & Private Forestry, Northeast Area, St. Paul Field Office Report S-68-13. 18pp.

Millers, I. and G. W. Erickson. 1969. Biological Evaluation of Saratoga spittlebug on the Nicolet National Forest based on 1969 scar-count surveys. USDA, Forest Service, Northeastern Area, State & Private Forestry, St. Paul Field Office Report S-69-38. 9 pp.

Unknown. 1969. Saratoga spittlebug control project, Huron-Manistee National Forests. (In-service report from Huron-Manistee National Forest. 6 pp.